E.2.2 NEVADA TEST SITE

After underground nuclear tests at NTS, radioactive and hazardous materials were extracted and analyzed. These activities have resulted in the accumulation of low-level, hazardous, and mixed wastes that must be treated, stored, and disposed of. The *Site Book for Waste Management* (May 1994), the *Waste Management Plan for the Nevada Test Site* (February 1995), the *NTS Site Treatment Plan and Federal Facility Compliance Act Consent Order* (March 1996), and the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/EIS 0243) (NTS Site-Wide EIS) detail waste management activities at NTS.

Radioactive and hazardous wastes (according to the current definition of hazardous wastes) generated from past nuclear testing activities were disposed of in Areas 2, 3, 5, 6, 8, 9, 12, and 23. These were mixed wastes and LLW composed of debris, drilling mud, decontamination wastes, laboratory, and classified wastes. Areas 3 and 5 are still currently active for waste storage and disposal. Area 3 receives offsite and onsite bulk waste for disposal in subsidence craters. An RCRA closure plan for this facility has been submitted to the Nevada Division of Environmental Protection. The Radioactive Waste Management Site in the north of Area 5 contains LLW management units and receives packaged classified and unclassified LLW. NTS also has TRU waste from Lawrence Livermore National Laboratory (LLNL) in storage and a hazardous waste storage unit. The NTS currently is not accepting mixed wastes from any locations. Mixed waste could be accepted from Defense-related generators within the State of Nevada; however, there is no mixed waste ready for disposal that meets the land disposal restrictions of RCRA. Mixed waste from out-of-state generators has been disposed at NTS in the past. This practice is planned for the future contingent on approval and permitting (RCRA Part B) of future mixed waste disposal units and on actions resulting from the ROD for the Waste Management PEIS.

In the past, NTS hazardous waste was disposed of in landfills, through underground injection, in leachfields, and offsite. A goal of the NTS Environmental Restoration Project is to remove or immobilize hazardous substances, pollutants, and contaminants while achieving compliance with environmental laws and regulations. Environmental restoration activities will be guided by the ROD from the NTS Site-Wide EIS and the NTS Site Treatment Plan.[Text deleted.]

Pollution Prevention. The DOE Nevada Operations Office is an active participant in DOE's national waste minimization and pollution prevention program. A comprehensive waste minimization plan for NTS, completed in 1991, defines specific goals, methods, responsibility, and achievements for organizations. A waste minimization organization promotes waste minimization and pollution prevention and ensures compliance with DOE orders at NTS. A report on waste generation and waste minimization progress is published annually.

The DOE Nevada Operations Office publishes sitewide plans and guidance, and each contractor develops its own implementation plan. Plans and procedures have been developed limiting the number and types of hazardous materials used on the site. Since initiation of the waste minimization program, several steam-cleaning operations have been eliminated, and half of the hazardous solvents used at NTS have been replaced with nonhazardous solvents. Recycling and reclamation activities have been established to reuse lead, silver, lubricating oil, and trichlorotrifluoroethane. Automatic decontamination equipment, recycling fabrication tool coolant systems, and continuous oil change and reburn systems have been placed in service to reduce hazardous waste generation. Closed-loop effluent recycling for steam cleaning has eliminated the production of 17.8 million l (4.7 million gal) of wastewater annually and reduced hazardous waste generation by 90 percent. Two solvent waste stills recycle 85 percent of all solvents and thinners used. Nonhazardous aqueous solution parts cleaners have eliminated the need for parts cleaning solvents.

The procurement of all materials is also reviewed for the opportunity to reduce the purchase of hazardous materials for NTS operations. [Text deleted.] In addition, an education and training program for all site personnel and for the surrounding community is helping to increase awareness of practices and lessons learned in waste reduction.

Transuranic Waste. TRU and mixed TRU waste at NTS, which was generated at LLNL and shipped to NTS between 1974 and 1990, is stored on the TRU Waste Storage Pad in Area 5. All NTS TRU and mixed TRU waste is expected to be certified for disposal at WIPP in Carlsbad, NM, or at another suitable repository should WIPP prove to be unsatisfactory. The DOE Nevada Operations Office has the option to construct a TRU Waste Certification Building for breaching, sampling, and certifying containers of TRU waste to meet the WIPP waste acceptance criteria, which is expected to be finalized by June 1997 (NT DOE 1996b:EV-37). Other technologies, such as mobile characterization capabilities, are also being considered. This waste inventory consists of 612 m^3 (800 yd^3) of heterogeneous debris. The TRU waste is stored in the TRU Pad Cover Building on the TRU Waste Storage Pad to protect the containers from the environment. [Text deleted.] In addition, TRU and suspected TRU wastes from weapons tests were emplaced in boreholes. Decisions to retrieve this waste or leave it in place will be based on performance assessments required by 40 CFR 191 and/or on risk assessments required by the *CERCLA National Contingency Plan* or RCRA corrective action. Table E.2.2–1 lists the mixed TRU waste storage units at NTS.

Low-Level Waste. Contaminated soils created from past atmospheric nuclear weapons tests occur at various locations on NTS. Some of this surface contamination has been, or is planned to be, removed and disposed of as waste. Although the debris from underground weapons tests remains underground, samples of this debris brought to the surface for analysis must be disposed of as waste. The majority of LLW generated at NTS is disposed in subsidence craters in Area 3. This area also receives substantial quantities of containerized bulk waste from offsite DOE facilities. Some waste disposal units are being closed in this area, while others are being readied for future use. Area 5 receives low-level radioactive waste from both onsite and offsite generators. New disposal capacity is planned for this area, and the offsite generators will be required to meet the NTS waste acceptance criteria (which includes periodic reviews by the DOE Nevada Operations Office) to permit them to ship LLW for disposal at NTS.

Historically, the volume of waste received from offsite is approximately equal to or slightly greater than the volume of waste generated onsite. Onsite waste generation (other than environmental restoration waste) has declined due to cessation of nuclear testing with offsite receipts now dominating waste disposal activities. Remediation activities at NTS will produce waste streams that will have to be treated, stored, and disposed. Any incoming offsite waste shipments must meet NTS waste acceptance criteria. Fifteen generators currently ship LLW to NTS and nine additional generators are applying or are waiting for approval (NT DOE 1996c:4-48,4-49). The LLW disposal capacity in use or planned at NTS is listed in Table E.2.2–2.

Mixed Low-Level Waste. Mixed LLW is generated by Defense-related support activities, environmental restoration activities, and activities supporting TRU waste disposal at WIPP or at another suitable repository should the WIPP prove to be unacceptable. Wastes were generated by the analytical activities supporting weapons tests and consist of drilling muds and debris generated from tunnel reentry and rehabilitation. Additional wastes result from radiochemical analysis and from the decontamination of equipment and facilities used in sample extraction and analysis. NTS has received mixed wastes from other DOE sites and may receive additional waste in the future, pending the completion of the Site Treatment Plans for all DOE sites and issuance of proper permits. Mixed waste generated in the State of Nevada that meets the land disposal restrictions of RCRA can be disposed of in the Area 5 Mixed Waste Disposal Unit, Pit 3. Mixed wastes not meeting the land disposal restrictions requirements can be stored on the TRU Waste Storage Pad. A RCRA Part B Permit application for a new mixed waste storage unit was submitted in January 1995. Mixed LLW streams are being characterized to fully determine what technologies and capabilities are required for safe, environmentally sound, and compliant disposal. [Text deleted.]

Table E.2.2–2 lists mixed LLW storage and disposal facilities at NTS. Table E.2.2–3 lists the mixed LLW streams inventory and 5-year projected generation at NTS. The total volume is 296 m^3 (388 yd^3), including a 20,425-kilogram (kg) (45,000-pound [lb]) empty spent shipping cask. [Text deleted.]

Hazardous Waste. Hazardous waste is generated from ongoing operations at NTS. This waste consists of solvents, lubricants, fuel, lead, metals, and acids and is accumulated at various sites around NTS while awaiting shipment offsite to an RCRA-permitted facility. Over the next 5 years, additional satellite storage locations are planned. A separate accumulation site is located across the road from Area 5 to avoid potential cross-contamination with radioactive waste. The generation of hazardous waste at NTS is expected to decrease significantly because of the cessation of nuclear testing, the completion of environmental restoration activities, and the impact of waste minimization activities. Hazardous waste is stored on a 279-m^2 (365-square yard [yd^2]) covered pad in Area 5 (NT REECO 1995a:33).

Nonhazardous Waste. Nonhazardous sanitary waste is expected to be generated at the current rate for several more years, then at a lower rate due to the cessation of nuclear weapons testing. Recycling of paper, metals, glass, plastics, and cardboard has already resulted in some decrease in waste quantities. NTS has several sanitary landfills and construction landfills in operation.

Table E.2.2–1. Mixed Transuranic Waste Storage Facility at Nevada Test Site

Storage Unit	Input Capability	Total Area (m^2)	Comment
Asphalt Storage Pad	Mixed TRU solid, mixed LLW	8,300 (1,995 in TRU pad cover building)	Available storage capacity on the TRU Pad to be used for storage of future, onsite-generated mixed LLW that does not meet RCRA Land Disposal Restriction provisions.

Source: NT DOE 1996b.

Table E.2.2–2. Low-Level and Mixed Low-Level Waste Storage and Disposal Facilities at Nevada Test Site

Disposal Unit	Input Capability	Total Capacity[a] (m^3)	Comment
Mixed Waste, P03U Management Unit	Mixed LLW solid	118,908	Interim status. Onsite use only. RCRA Part A 1988. Environmental Assessment published, withdrawn. Considered in Site-Wide EIS.
LLW Disposal, P05U	LLW solid, wood, metal, rubble, debris	66,946	Operational. Additional 616,300 m^3 capacity available for expansion.
LLW Disposal, P06U	LLW solid	27,002	Operational, reserved for future use.
Classified Shallow Land Burial, T02C	LLW solid, metal in approved containers	1,698	Operational, no remaining capacity.
Shallow Land Burial, T03U	LLW solid, metal, debris, unclassified	7,086	Reserved for LLW disposal.
Classified Shallow Land Burial, T04C	LLW solid, metal in approved containers	1,518	Operational.
Mixed Waste Storage Pad	Mixed LLW solid	6,040[b]	Planned. RCRA Part B submitted in 1992.
Bulk LLW Disposal, U3AHAT	LLW solid, wood, metal, soil, biological	424,800	Operational.

[a] Schedules and capacity for facilities under design or construction are subject to changes such as availability of funds and permit issuance.

[b] Estimated assuming no aisle space and containers stacked 2-m high.

Source: NT DOE 1996b; NT REECO 1994a.

E.2.3 IDAHO NATIONAL ENGINEERING LABORATORY

Activities associated with the development of reactor technology and the extraction of useful nuclear materials at INEL have produced radioactive, mixed, and hazardous wastes that are treated, stored, or disposed of on the site. The Argonne National Laboratory-West (ANL-W) facilities generate and treat TRU, LLW, hazardous, and nonhazardous wastes that are disposed of by INEL per agreement between the DOE Idaho and Chicago Operations Offices. The ROD for the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (60 FR 28680), as amended (61 FR 9441), lists decisions dealing with site-wide environmental restoration and waste management programs at INEL.

Pollution Prevention. The DOE Idaho Operations Office has an active Waste Minimization and Pollution Prevention Program to reduce the total amount of waste generated and disposed of at INEL. This is accomplished by eliminating waste through source reduction or material substitution, by recycling potential waste materials that cannot be minimized or eliminated, and by treating all waste that is generated to reduce its volume, toxicity, or mobility prior to storage or disposal. The DOE Idaho Operations Office published its first waste minimization plan in 1990, which defined specific goals, methodology, responsibility, and achievements of programs and organizations. The achievements and progress have since been updated at least annually.

Spent Nuclear Fuel. The inventory of spent nuclear fuel at INEL is cited here in metric tons (t) of heavy metal based on currently available references. There are 109 t (120 tons) of spent nuclear fuel stored at ICPP, 129 t (142 tons) at the Test Area North (TAN), 30 t (32.6 tons) at ANL-W, and 6 t (6.6 tons) at the Naval reactors, test reactors, and power burst facilities. Spent nuclear fuel is stored in facilities designed for a specific fuel type; therefore, storage capacities are not additive for the site. There are 11.6 t (12.8 tons) of graphite reactor fuel, 10.2 t (11.2 tons) of naval reactor fuel, and 252.2 t (278 tons) of commercial and research reactor fuels in the inventory (DOE 1995j:2-7,2-8,3-7). Naval Reactor Facility and Test Reactor Area fuel will be sent to the ICPP for storage. The TAN fuel pool is nearing its design life expectancy. The Three Mile Island core debris stored there will be repackaged and placed in dry storage. Experimental Breeder Reactor-II at ANL-W has its own fuel reconstitution facility to process waste.

The treatment of spent nuclear fuel for long-term storage and disposal is expected to continue at INEL for the next 40 years. Existing rulings designate spent nuclear fuel as a recoverable resource; as such, waste regulations for treatment, storage, and disposal do not apply. There are no plans to dispose of spent nuclear fuel at INEL. Figure E.2.3–1 illustrates spent nuclear fuel management at INEL. As a result of the amended ROD (61 FR 9441) from the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE/EIS-0203-F), non-aluminum-clad fuels and naval spent fuel will be shipped to INEL for storage. This will increase the spent nuclear fuel to be managed at INEL from 274 t (302 tons) to 381 t (420 tons). INEL will make 114 shipments of aluminum clad spent nuclear fuel to SRS and receive 1,133 shipments of non-aluminum-clad spent nuclear fuel from other DOE sites.

High-Level Waste. HLW has been generated during the reprocessing of spent nuclear fuel at the ICPP. Most of this fuel was from the naval reactors program. The liquid HLW is concentrated by evaporation and converted to metallic oxides by calcination in a fluidized bed. These are then stored in a stable granular solid form. This waste form is stored in stainless steel bins in concrete vaults, where it can be held long enough that the short half-life isotopes have decayed and its activity is reduced. This waste form is a mixed HLW because of the toxic metals it contains.

Liquid HLW in acidic solution is stored in stainless steel tanks. All of this waste will be calcined to allow INEL to meet requirements of a December 9, 1991, Consent Order with the State of Idaho and EPA to cease the use of existing storage tanks without building new tanks. The Department proposes to construct a facility to treat the calcined waste (and any remaining liquid waste) in accordance with RCRA on a schedule to be negotiated

with the State of Idaho under the *Federal Facility Compliance Act*. The Department has selected radionuclide partitioning followed by grouting to immobilize the low-activity waste and vitrification to immobilize the high-activity waste. The HLW inventory, treatment and storage facilities (for example, the High Efficiency Particulate Air [HEPA] Filter Storage Facility) at INEL are listed in Tables E.2.3–1, E.2.3–2, and E.2.3–3. Figure E.2.3–2 illustrates HLW management at INEL.

Transuranic Waste. TRU and mixed TRU wastes are stored at the Radioactive Waste Management Complex (RWMC). Prior to 1970, when the Atomic Energy Commission determined that TRU waste required segregation from other wastes, TRU waste was buried in earthen trenches. Since that time, TRU waste has been segregated into contact-handled and remote-handled categories, then packaged and stored for ultimate retrieval and transport to an offsite repository at WIPP. INEL contains 58 percent of DOE's TRU waste. The majority of TRU waste at INEL was shipped from other sites, particularly Rocky Flats Plant (now known as the Rocky Flats Environmental Technology Site [RFETS]), but this practice was stopped in 1989.

The existing treatment facilities for TRU waste at INEL are limited to testing, characterization, and repackaging. The Idaho Waste Characterization Facility, now in the planning phase, will characterize TRU waste and either reclassify it (if it is found to be LLW) for disposal onsite, or prepare it so that it meets the WIPP waste acceptance criteria. The use of commercial treatment facilities is being considered. Modifications of the RWMC to support commercial treatment of alpha-contaminated mixed LLW, the construction of the Advanced Mixed Waste Treatment Project and the Mixed LLW Disposal Facility, and the Plasma Hearth Process Project are being considered subject to funding restraints and additional NEPA review.

The TRU waste at INEL is being stored pending the outcome of the WIPP program. Assuming WIPP is determined to be a suitable repository for these wastes, pursuant to the requirements of 40 CFR 191 and 40 CFR 268, these wastes will be transported there for disposal. DOE will begin discussions with the State of Idaho regarding treatment options for mixed TRU waste in January 1998, if the Secretary of Energy does not decide to operate WIPP as a disposal facility by that time; or at such earlier time as DOE determines that (1) there will be a delay in the opening of WIPP substantially beyond 1998 or (2) the No-Migration Variance Petition is not granted by the EPA. DOE will propose modification to the INEL Site Treatment Plan for approval by the State of Idaho within a timeframe agreed upon between DOE and the State of Idaho. These modifications will describe planned activities and schedules for the new mixed TRU waste strategy. Figure E.2.3–3 illustrates TRU waste management at INEL. Tables E.2.3–4, E.2.3–5, and E.2.3–6 list the TRU and mixed TRU wastes inventory, and treatment and storage facilities at INEL. Some TRU waste at INEL will never meet WIPP waste acceptance criteria and therefore cannot be sent to WIPP. Other options will have to be developed for these wastes. Approximately one-half of the TRU waste is expected to be reclassified as alpha-contaminated LLW in the future. This waste does not meet INEL waste acceptance criteria for LLW and therefore will be managed as TRU waste. Additionally, INEL may accept TRU waste from other sites for treatment. The treated waste would be returned to the generator or sent to an offsite disposal facility (assumed to be WIPP).

Low-Level Waste. LLW is generated in various forms at INEL facilities. This waste is disposed of at the RWMC. Most of this waste is processed onsite or offsite before disposal by incineration, compaction, or sizing to reduce volume and to stabilize the waste to the maximum extent possible. Some LLW does not meet criteria for onsite disposal. This waste is stored temporarily until treatment and disposal options are developed. Liquid LLW is either evaporated and processed to calcine, or solidified and disposed of. The volume of LLW disposed of at INEL's RWMC is 145,000 m^3 (189,600 yd^3). As of 1991, the facility had an 180,000-m^3 (235,345-yd^3) capacity, with an additional 67,000 m^3 (88,000 yd^3) of expansion capacity available (DOE 1995j:4.14-2). Figure E.2.3–4 illustrates LLW management at INEL.

Mixed Low-Level Waste. Mixed LLW is generated in small quantities at INEL and is stored in several areas onsite (ANL-W, ICPP, Special Power Excursion Reactors Test). INEL may also receive limited volumes of mixed LLW from other sites for treatment, with the residuals being returned to the generator. The Waste Experimental Reduction Facility, the Waste Reduction Operations Complex, the ICPP, ANL-W and TAN will

process mixed LLW. [Text deleted.] Additional facilities (Advanced Mixed Waste Treatment Project, Mixed/LLW Disposal Facility, and Remote Mixed Waste Treatment Facility) planned for INEL would be able to treat mixed waste and render it acceptable for disposal. Figure E.2.3–5 illustrates mixed waste management at INEL.

Although mixed liquid and solid wastes generated from past operations are stored in many locations at INEL, the bulk of that volume is solid waste stored at the RWMC. Its volume is approximately 66 percent of the TRU waste volume also stored there and is 11 percent of the total volume of waste stored or disposed of at that facility. The inventory of mixed LLW, and treatment and storage facilities at INEL are listed in Tables E.2.3–7, E.2.3–8, and E.2.3–9.

Hazardous Waste. Hazardous waste is staged in a RCRA-permitted building at the Central Facilities Area (CFA) prior to shipment to an offsite commercial RCRA-permitted facility. Table E.2.3–10 lists the hazardous waste quantities shipped offsite in 1994. The INEL waste minimization program is expected to significantly reduce the quantities of hazardous wastes generated at INEL over the next 5 years. By that time, the use of nonhazardous chemicals and the recycle of those for which there is no substitute should nearly eliminate the generation of hazardous waste.

Nonhazardous Waste. Nonhazardous (industrial and sanitary) wastes are processed at each facility on the INEL site and disposed of at the CFA or at the Bonneville County landfill. Wastes are segregated into sanitary, industrial, and asbestos wastes before emplacement. Increased recycling is expected to reduce nonhazardous waste generation by 50 percent by 1997. A new multipurpose facility is planned to be in operation at ANL-W by 1996 to collect, monitor, and consolidate ANL-W nonhazardous wastes before shipment to the CFA. INEL will continue its existing industrial waste program in the future; this will require expansion of the 4.8 ha (12 acres) CFA landfill by 91 ha (225 acres) to provide capacity for the next 30 years (60 FR 28680).